ESCOLA SUPERIOR DE TECNOLOGIA DA SAÚDE DE LISBOA
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Surfaces contamination with 5-Fluorouracil in two Portuguese Hospitals

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ACT
AUTORIDADE PARA AS CONDIÇÕES DO TRABALHO

BACKGROUND

- ✓ The use of antineoplastic drugs in cancer therapy is increasing due to their action in cancer cells.
- ✓ Carcinogenic, mutagenic and teratogenic effects.

IARC, 1987, 1997; Schierl et al., 2009

- ✓ Since 1979 Falck *et al.* recognized the potential health hazard in occupational exposure.
- ✓ Some studies demonstrated that nurses and pharmacy personnel involved in preparation or administration are exposed to antineoplastic drugs.

Pethran et al., 2003; Turci et al., 2003; Fransman et al., 2007

HOW EXPOSURE OCCURS?

- ✓ Contact with contaminated surfaces have an important role in exposure to antineoplastic drugs due to dermal absorption.

  Hirst et al., 1984; Sessink et al., 1994; Kromhout et al., 2000; Fransman et al., 2005; Schierl et al., 2009

- ✓ Contamination levels in the workplace surfaces should be as low as possible.

- ✓ Surfaces contamination assessment is a common way to estimate occupational exposure and the most common method used is wipe sampling.

Hedmer et al., 2004, 2008

STUDY DEVELOPED

AIM: assess 5-Fluorouracil (5-FU) contamination on the surfaces of two Portuguese Hospitals (preparation and administration units).

- ✓ 5-FU is one of the most frequently antineoplastic agent used in Portuguese Hospitals and can be easily absorbed through the skin.
- ✓ This drug can be used as an marker of surfaces contamination and exposure and have been extensively discussed in other studies.

Larson et al., 2003; Castiglia et al., 2008; Schierl et al., 2009; Hedmer and Wohlfart, 2012; Kopp et al., 2013

SOME 5-FU CHARACTERISTICS

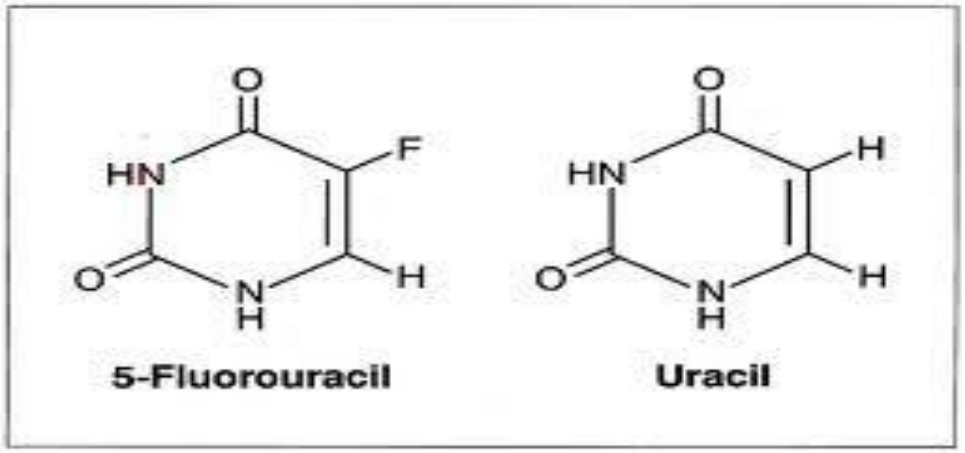
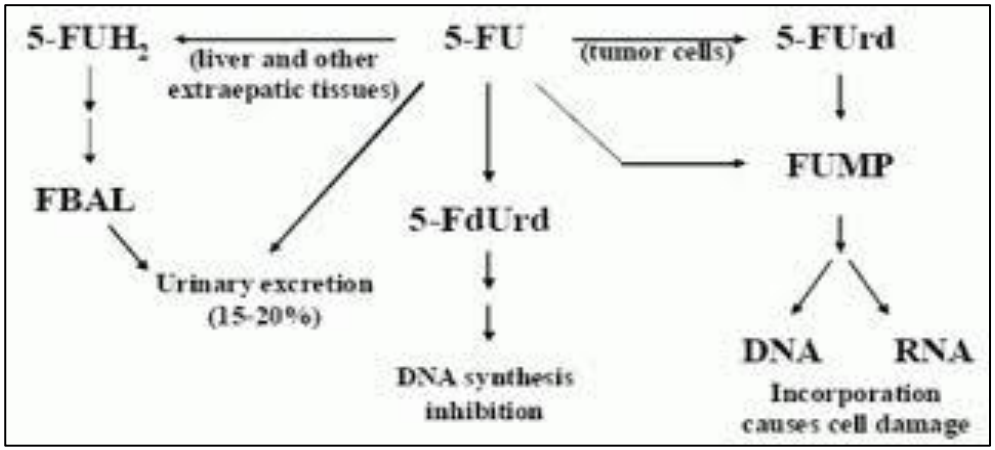


Figure 1: Clinical structures of 5-FU and uracil. Adapted with permission from Valeriote et al.[2]
5-FU = 5-fluorouracil.

Similarity with one of the four nucleobases (uracil) in the nucleic acid of RNA.



5-FU Toxicokinetic

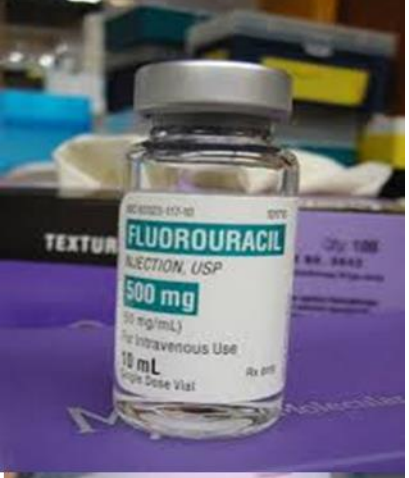
MATERIALS AND METHODS

- ✓ Wipe sampling in the workplaces surfaces.
- ✓ Sampling campaigns were developed in two different days in both Hospitals.
- ✓ Before wiping, gauzes were moistened with a solvent (ethyl acetate).
- ✓ Sampling was performed by consecutive wiping to cover an area of 10x10 cm.
- ✓ Sampled locations were: storage cabinets, preparation and packing benches, hoods, transfers, chairs and beds for drug administration, worktops, infusion pumps and trays.
- ✓ Extraction and analysis done as described by Schmaus *et al.*, (2002).
- ✓ HPLC-DAD (LOQ =10 ng/cm^2).

RESULTS

- ✓ 348 samples were taken and 39 (11.2%) > LOQ.
- ✓ Highest value in the preparation area (storage cabinet of Hospital A - 78.8 ng.cm^{-2}).
- ✓ Higher number of contaminated samples in administration areas

Values in ng.cm^{-2}	Hospital A (n=70)	Hospital B (n=278)
Contaminated Samples	17 (24%)	22 (8%)
Traces	13 (19%)	81 (29%)
Preparation	n= 42	n = 173)
Contaminated (>LOQ)	5 (12%)	8 (5%)
Mean (ng.cm^{-2}) ± SD	46.2 ± 32.6	16.58 ± 5.1
Administration	n=28	n=105
Contaminated (>LOQ)	12 (43%)	14 (13%)
Mean (ng.cm^{-2}) ± SD	16.4 ± 12.32	17.27 ± 6.27



DISCUSSION

- ✓ 5-FU is considered a suitable marker for occupational exposure because: is frequently used in preparations and in high amounts in both hospitals.

Castiglia et al., 2008

- ✓ Our results showed contamination by 5-FU: **Possible exposure to this and others antineoplastic drugs.**

- ✓ 5-FU was not handled in days where contamination was found on the surfaces:

Inefficiency of hygiene procedures as a cause to surfaces contamination.

Acampora et al., 2005; Castiglia et al., 2008; Hedmer et al., 2008

DISCUSSION

Higher value of contamination in a storage cabinet

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Surfaces unrelated to the direct handling of drugs can also be contaminated

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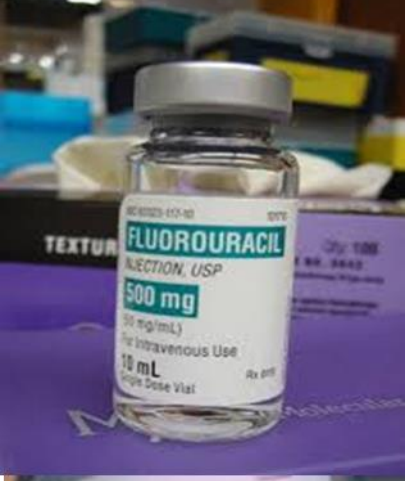
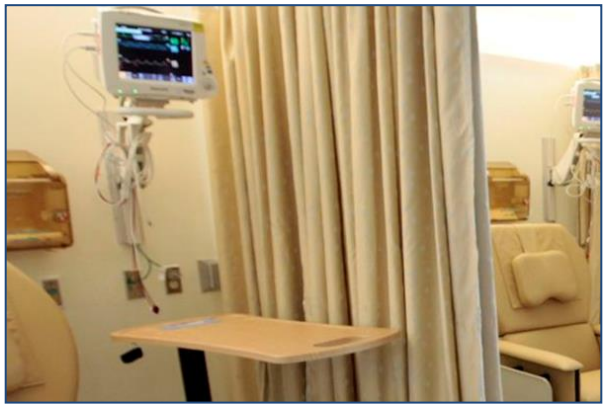
Wide spread surfaces contamination in these places and/or primary package contamination (*Favier et al. 2005)*



DISCUSSION



Administration areas presented a higher number of samples contaminated

In administration areas there is less care in handling these drugs probably due to the lack of implemented good practices and safety procedures *(Cherrie et al., 2006)*

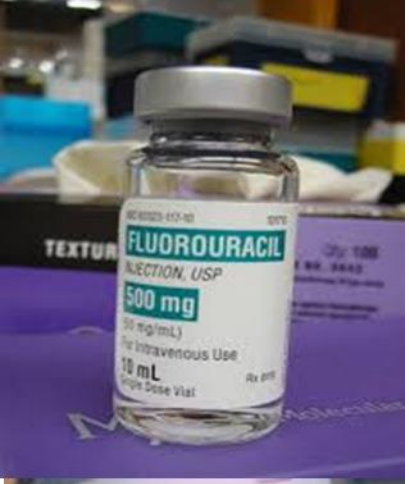
SOME CONSIDERATIONS

There are no occupational exposure limits for drugs classified as carcinogen for humans

ALARA principle ("as low as reasonably achievable") in terms of an intension to keep the exposure to carcinogenic substances at the lowest achievable level

All the workplaces should be absent of antineoplastic drugs contamination!!

Castiglia et al., 2008

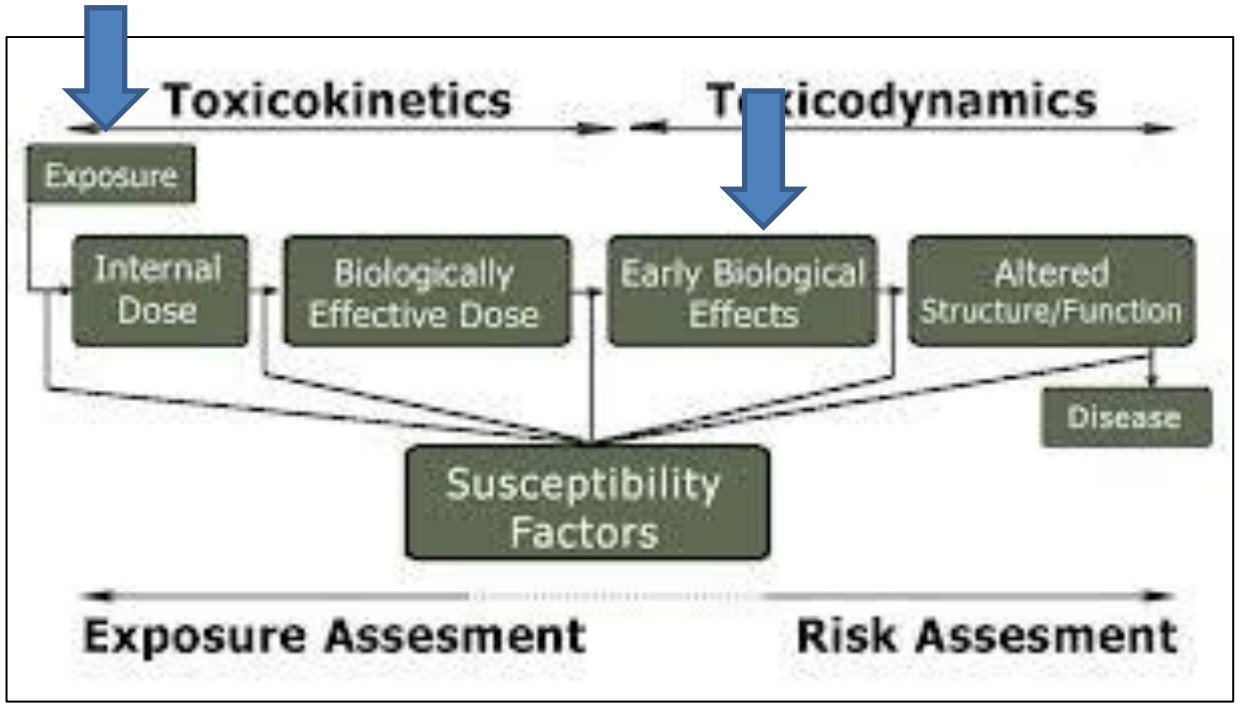


MOST IMPORTANT CONCLUSIONS

- ✓ Both hospitals presented surfaces contaminated with 5-FU, which also suggests possible contamination by other antineoplastic drugs.
- ✓ Preparation areas presented less contaminated samples than administration areas.
- ✓ Need of constantly promote good practices and safety procedures among all the professionals that handled these drugs.
- ✓ Routine monitoring of surfaces contamination is important to ensure the appliance of safety procedures.

ONGOING RESEARCH

- ✓ Analising more data related with other drugs
- ✓ Analising data from Biologic Exposure Indicators: Genotoxic Effects Indicators (MNT and Comet Assay).



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